Printed Pages—4 EE—403

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2023 Roll No.

B.Tech.

FOURTH SEMESTER EXAMINATION, 2004-2005

ELECTRICAL ENGINEERING MATERIALS

Time : 2 Hours *Total Marks : 50*

Note : *(i) Attempt ALL questions.*

(ii) In case of numerical problems assume data wherever not provided.

1. Attempt ***any four*** parts of the following : **(3x4=12)**

(a) Explain the terms space lattice, coordination number and atomic packing factor.

(b) Show that for simple cubic system $d_{100} : d_{10} : d_{111} :: \sqrt{6} : \sqrt{3} : \sqrt{2}$.

(c) Explain with diagrams point imperfection, line imperfection and surface imperfection.

(d) State and explain Bragg's law. How can it be used to determine lattice parameters ?

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(e) X-rays are produced when high energy electrons are suddenly brought to rest by collision with solid. If all the energy of each electron is transferred to a photon, calculate the wavelength of X-rays when 25 KeV electrons are used.
Given : $h = 6.625 \times 10^{-34}$ JS.

(f) Name three solid insulating materials used in electrical appliances and describe their properties.

2. Attempt *any four* parts of the following : **(3x4=12)**

(a) Explain the terms : Thomson effect, seebeck effect and Peltier effect.

(b) Describe different ways of emission of electrons from metals and briefly explain thermionic emission.

(c) Calculate the Hall voltage across the width of a semiconducting specimen from the following data :

Width of specimen = 0.1 m

thickness of the specimen = 0.01 m

field applied perpendicular to width and length = 0.6 T.

Current flowing lengthwise = 10 mA

Hall coefficient = $3.8 \times 10^{-4} m^3/c$

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(d) Explain super conductivity. Give properties of super conductors and enlist important applications.

(e) Distinguish between extrinsic and intrinsic semiconductors. Give their energy diagrams.

(f) Write short notes on :

(i) photoelectric effect

(ii) fermy energy

(iii) thermo couple

3. Attempt *any two* parts of the following : (6.5x2=13)

(a) Describe various mechanisms of dielectric polarization and derive an expression for electronic polarizability.

(b) Show that the internal field inside dielectrics is expressed as Ei = p/3Eo where P is polarization.

(c) Explain the terms :

(i) dielectric loss

(ii) piezoelectricity

(iii) polar and non polar dielectrics

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4. Attempt *any two* parts of the following : **(6.5x2=13)**

(a) Distinguish between diamagnetism, paramagnetism and ferriomagnetic materials. Name one in each case.

(b) Draw the hysteresis curve for a ferromagnetic material. Explain the nature of the curve from domain theory. What is magnetostriction ?

(c) What are ferrites ? Name few commonly used ferrites. Explain their advantages as compared to metallic ferromagnetics.

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